

MARINE ENGINES

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With regard to the cast-steel low-pressure piston and the second intermediate pressure piston, the thickness in inches of the metal near the boss may

be — + 0.8 and -1.0 respectively,
the thickness near the rim being

$$5^{\circ} \quad 34$$

0.7 of the thickness near the boss.

D is the diameter of the cylinder.

Connecting-rod.—The connecting-rods are from four to six cranks long, 5 : 1 being a very suitable ratio. The middle of the body of the rod should have a diameter not less than that of the piston-rod, and the diameter of the top end near the fork should be such as to give a stress of not more than 5000 lb. per square inch, as the stress is alternating in direc-

tion. The rod usually has a straight taper to the foot. These dimensions are sufficient to make the rod stable against the combined effects of the axial crippling load and the bending effect of the inertia of the rod as it swings. The gudgeon bearings are of gun-metal, and when large are cored out at the back for lightness. The bolts have a stress of 4500

to 5000 lb. per square inch at the bottom of the thread, and the caps may be

J to J in. thicker than the diameter of the bolts, according to the size of the work. This will usually give the stiffness required and a satisfactorily

low stress which should not, however, exceed 8000 to 9000 lb. per square inch, taking the cap as a beam with a uniform distributed load. The nuts are secured by locking screws, the points of which engage in a groove cut in a cylindrical portion turned on the nut, which projects into

a suitable recess in the cap. A liner is usually fitted between each pair of brasses at the joint to permit of adjustment. Sometimes this liner, instead

of being solid, is composed of one thick piece with a number of other pieces of varying thicknesses down to -grV in. in thickness. The fork at the top

end of the rod is usually Y-shaped with straight sides to suit the shape of the crosshead. The metal forming the sides is subjected to bending stresses in both directions, and the stress should be calculated at one or two sections, taking the bending moment as half the load on the piston multiplied by the distance between the centre of one of the bearings and the neutral axis of the section.

As the stress is of an alternating kind it should be kept low^r, say 5000 to 6000 lb. per square inch. This also allows for the tensile and compressive stresses. If these are taken into account the stress may be 9000 lb. per square inch. In order to prevent the possibility of the sides of the Y spreading under stress some makers form a collar upon the end of the gudgeons. This certainly is safer. The bottom end of the rod is designed after the diameter and length of the crank pin has been fixed.

The bottom end bearings are often made of steel castings lined with white metal. The bending moment upon the cap in the centre may be

taken as $\frac{PL}{8}$, where P lb. is the piston load and L in. is the distance

between the bolt centres. A stress of 7000 to 8000 lb. per square inch may be allowed. A distance piece composed of several liners of brass of assorted thicknesses separates the two halves. The width of the connecting-